APPLICATION FOR PATENT

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Title: Downhole Screen Manufacturing Method

FIELD OF THE INVENTION

[0001] The field of the invention is a method of manufacturing screen assemblies for downhole use and more particularly a method involving expansion of the base pipe to attach the filtration material to it.

BACKGROUND OF THE INVENTION

[0002] Screen used downhole typically involved welding the screen material to a base pipe at opposed ends to retain the layers together. Typical of such assembly techniques are U.S. Patents 3,908,256; 3,958,634; 4,284,138 and 4,428,423. There are drawbacks to the welding technique of attaching a filter layer to a base pipe below it. One hazard is that the weld or welds could give out under conditions creating stress between the base pipe and the filtration layer. The base pipe could be in tension to such an extent from forces applied to it from above or from weight of tools and pipe hanging below that a weld failure could occur. When exotic materials are used there are added risks of corrosion at the welds to the base pipe. Since the filtration layer could become obstructed in use, concerns of collapse resistance of the filtration layer could arise in that the only secure connection to the base pipe is at the welds on either end of the filtration layer. Differential pressures on the filtration layer, particularly when partially fouled could lead to weld failure and a bypassing of the filtration layer.

[0003] In the past, techniques for manufacturing screens for downhole use have involved formation of overlapping layers of filtration material into a tube shape and forcing the concentric layers through a die to get them joined to each other without resort to welding a layer to the nest or welding seams in each layer. This technique is illustrated

in U.S. Patent 5,611,399. In other applications downhole screens that were made using the welding technique to attach a filter layer to a base pipe were run in the well and expanded for open hole completions.

[0004] The present invention employs a technique of slipping the filtration layer over the base pipe and then expanding the base pipe to get a preferably interference fit with the base pipe, thereby avoiding welding in the assembly process. Different types of filtration layers are envisioned. The expansion can be over the length of the base pipe that underlays the filtration layer or even just in discrete areas of the base pipe to secure the filtration layer. These and other advantages of the present invention will be more apparent to those skilled in the art from a review of the description of the preferred embodiment, the drawings and the claims, which all appear below.

SUMMARY OF THE INVENTION

[0005] An assembly method for a downhole screen is disclosed. In the preferred embodiment, the filtration layer is slipped over a perforated base pipe and an expansion technique is used to increase the base pipe diameter to the point where, preferably, an interference fit exists. The expansion can be fully underneath the filtration layer or can be done in discrete zones. The finished assembly can still be expanded further downhole, such as, for example, in open hole completions. An outer protective shroud can be employed over the filtration layer when the expansion of the base pipe occurs.

DETAILED DESCRIPTION OF THE DRAWINGS

[0006] Figure 1 illustrates a perforated base pipe;

[0007] Figure 2 illustrates a wire wrapped filtration layer before it is slipped over the base pipe;

[0008] Figure 3 is an end view along lines 3-3 of Figure 2;

[0009] Figure 4 shows the expansion of the base pipe in progress;

[0010] Figure 5 is the complete screen assembly after expansion of the base pipe;

[0011] Figure 6 is a section through the assembly before expansion of the base pipe;

[0012] Figure 7 is a section through the assembly after expansion of the base pipe;

[0013] Figure 8 shows an alternative method using rods brazed to the base pipe that secure the filter layer upon heating from within the base pipe.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] Referring to Figure 1 a base pipe **10** has multiple openings **12** that can be of any shape and in any pattern and made in a variety of different ways that are known in the art. A filter layer **14** can have a variety of configurations. In Figure 2 it is shown to have a cylindrical shape obtained by a series of ribs **16** that are held in a cylindrical shape by a wound wire **18** of preferably triangular cross-section. The depicted spiral wound wire screen, shown in Figure 2, is of a type known in the art. Other filter layers can be used that are, for example, a weave of wires into a cylindrical shape having one or more layers and having a desired opening size or prepacks made from any variety of materials including sintered beads.

[0015] The preferred method of securing the filter layer **14** to the base pipe **10** is shown in Figures 4-7. In Figure 4 the filter layer has been slipped over the base pipe **10** and the expansion of the base pipe **10** has begun with a schematically depicted swage **20** that represent any one of a number of ways to expand a pipe. In the preferred embodiment, an interference fit is obtained by expansion of base pipe **10**. While the full length of the base pipe **10** under the filter assembly can be expanded with swage **20**, the invention encompasses expanding base pipe **10** in selected zones, such as at the ends of the filter layer **14** or in other locations. The base pipe **10** can also be expanded for the entire length of the filter layer **14** and then extending beyond the ends on one or both ends. Preferably, an interference fit should be created from the expansion. The expansion may be continued downhole such as in open hole completions where the annular space around the screen is reduced or eliminated as an alternative to gravel packing.

[0016] As an alternative, the dimension of the filter layer **14** can be reduced once placed over the base pipe **10** or a combination of increasing the base pipe dimension while reducing the filter layer dimension is also contemplated. The filter layer **14** can be pre-expanded to allow insertion of the base pipe and then the filter layer can be allowed to retract elastically to a position where it is engaged to the base pipe, preferably with an interference fit.

[0017] Figure 6 is a section view of the filter layer **14** over the base pipe **10** with a gap **22** between the outer surface **24** of the base pipe **10** and the ribs **16**. In Figure 7, it can be seen that the gap **22** has been closed due to expansion.

[0018] The advantage of the method of the present invention is to provide greater resistance of the filter layer **14** to tensile loads transmitted from the base pipe **10**. There is greater collapse strength in the filter layer **14** because the interference fit between the filter layer **14** and the base pipe **10** provides firm support over as much as the entire length of the filter layer **14**. With the need to weld eliminated, the screen can be made more cheaply and in some application the corrosion that could be an issue at the welds is eliminated.

[0019] Figure 8 discloses an alternative method. Here the base pipe **10** has rods **11** secured to it in an offset pattern from the ribs **16**. The rods **11** can be brazed to the base pipe **10**. When the base pipe **10** is heated, preferably internally, the rods **11** attach to the filter layer **14**, without the need for expansion of the base pipe **10**. Alternatively, the base pipe **10** can be coated with a brazing material. The filter layer is slipped over the base pipe **10** and heat is applied until the brazing material acts to adhere the filter layer **14** to the base pipe **10**. Thus, the coating of the brazing material can be used instead of the brazed rib wires to get the same result of attachment due to applied heat to the assembly either from within or from outside the base pipe **10**.

[0020] The foregoing disclosure and description of the invention are illustrative and explanatory thereof, and various changes in the size, shape and materials, as well as in the details of the illustrated construction, may be made without departing from the invention.